

# Quality of Life and Knee Function in Patients with Knee Dislocation

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## Abstract

**Background:** Knee dislocations are uncommon (<0.5% of all dislocations); however, they may result in catastrophic outcomes secondary to their high-energy nature and neurovascular injuries. **Objectives:** The objective of this study was to evaluate the clinical outcome of knee dislocation management. **Subjects and Methods:** A total of 20 consecutive adult patients with knee dislocation were enrolled in this cross-sectional study between 2011 and 2014. A single knee surgeon examined all the patients for knee instability for subjective evaluation of knee function using the Lysholm Knee Questionnaire, Knee Society Score (KSS), and Short Form-36 (SF-36). **Results:** The average Lysholm Knee Scores and KSS were 68 (range: 18–100) and 65 (range: 15–97), respectively. All domains of SF-36 among the studied patients were lower than that of the normal population. We could not find any correlation between age, body mass index, and interval between initial trauma and operation with outcome variables (Lysholm Knee Score, KSS, and SF-36 Physical Component Score, and SF-36 Mental Component Score). **Conclusions:** The knee function after proper management of dislocation is reasonable, but prolonged course of management and multiple operations may decrease the patients' quality of life.

**Keywords:** Knee dislocation, knee function, quality of life

## INTRODUCTION

Knee dislocation entails complete disruption of the integrity of tibiofemoral articulation.<sup>[1]</sup> It is more common in men, and the peak incidence is in the third decade of life.<sup>[2-4]</sup> Although knee dislocations are uncommon and only consist of <0.5% of all dislocations, they may result in catastrophic outcomes.<sup>[5]</sup> Vascular injuries are common among knee dislocations and are estimated to involve 35%–45% of the cases.<sup>[6]</sup> Since these injuries are usually associated with high-energy trauma and may involve multisystems, many victims may have other emergency surgical issues, limiting comprehensive evaluation of the limb in emergency rooms. Some of the knee dislocations have been reduced spontaneously before hospital admission, avoiding prompt diagnosis in emergency room. Vascular injury may be presented with intimal raptures and without alterations in pulse palpation in primary examination, resulting

to further ischemia and amputation.<sup>[7,8]</sup> Secondary to pain and other injuries, the patient may refuse to attempt dorsiflex their foot or toes, so the accurate examination of peroneal nerve may be overlooked.<sup>[9]</sup> All these features associated with knee dislocation make the situation unpredictable. Considering the nature of knee dislocations and the associated neurovascular injuries, a little is known about the quality of life of the affected patients. In this study, we have evaluated the final effects of knee dislocation on patients' knee stability and function as well as quality of life. Moreover, we have tried to find the factors that might predict the final outcomes.

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## SUBJECTS AND METHODS

### Study design

A total of twenty consecutive adult patients with knee dislocation were enrolled in this cross-sectional study between 2011 and 2014 in our academic Level 1 trauma center. All patients were adult with no history of previous deformity or disability in the affected limb. The study was approved by our Institutional Review Board. All the patients signed an informed consent before participation in the study.

### Data collection

After retrieving the patients' data from medical records, they were called and asked to attend an evaluation session and fill in a questionnaire. Knee dislocation was classified according to the direction of dislocation toward any of the five groups of anterior, posterior, medial, lateral, and rotational. We used medical charts of the patients at the time of knee dislocation and preoperative radiography information from our Picture Archiving and Communication System. Age, sex, body mass index (BMI), mechanism of injury, stability evaluation, and neurovascular status were recorded in a checklist. All patients had lower-limb angiography at the time of initial injury. A knee surgeon individually examined all patients for knee instability by means of Lachman test, anterior and posterior drawer tests, and the varus and valgus stress tests. The varus and valgus stress tests were performed at 30°, as the medial collateral ligament is best examined at this degree of flexion.<sup>[10,11]</sup> The affected limbs were compared with the normal sides for more accurate judgment. The knee range of motion was measured using an orthopedic goniometer. The Lysholm Knee Questionnaire and Knee Society Score (KSS) were used for subjective evaluation of knee function. All patients were also asked to fill in a validated Persian Short Form-36 (SF-36) questionnaire in order to assess their general health status.

### Tools

#### Lysholm Score

The Lysholm Knee Questionnaire is used to evaluate the total knee function in eight domains consisting limp, support (stick or crutch), locking, instability, pain, swelling, stair-climbing, and squatting. The scoring scales in Lysholm questionnaire are as follows: excellent (>90), good, (84–90) fair (65–83), and poor (<65). The maximum score (100) indicates full knee function. The validity and reliability of this questionnaire have been already confirmed by a previous study.<sup>[12]</sup>

#### Knee Society Score

This checklist has been designed to evaluate knee function during the past 4 weeks. Items that are assessed in KSS include pain, flexion contracture, extension lag, total range of motion, alignment, and stability. The score is interpreted as excellent, good, fair, and poor for 100–80, 79–70, 69–60, and below 60, respectively. The validity and reliability of this tool also had been confirmed by a previous study.<sup>[13]</sup>

#### The Short Form-36

The SF-36 questionnaire defines “health-related quality of life”

and has eight domains (physical function, role-physical, bodily pain, general health, vitality, social function, role-emotional, and mental health). Items on this instrument are measured using a 5-point response scale in which the higher scores indicate higher functioning. Each response in the eight domains of the SF-36 health survey has been given a value from 0 to 100. The Persian version of the SF-36 has been evaluated in terms of validity and reliability in the Iranian population in many clinical settings.<sup>[14,15]</sup>

### Ethical consideration

The questionnaires were anonymous, and patients were assured that their information would be kept confidential. An informed consent was obtained from the patients. They could choose to withdraw from the study any time before or during the completion of the questionnaires.

### Statistical analysis

SPSS software version 16 (SPSS Inc., Chicago IL, USA) was used for statistical analysis. The Mann–Whitney U-test was used to compare the means of two independent variables. Spearman's rank test was used to assess the correlation between XXX and XXX. High, moderate, and low degrees of correlation were defined as >0.75, 0.75–0.50, and <0.50, respectively.  $P < 0.05$  was deemed as statistically significant. We did not perform multivariable analysis due to the low number of patients.

## RESULTS

### Demographic results

The study group consisted of twenty patients (17 men and 3 women) with a mean age of  $35 \pm 15$  years (range: 18–60 years). The follow-up period for patients was 22 months (ranged: 8–40 months). Twelve patients (60%) had posterior dislocations, seven (25%) anterior, two (10%) posterolateral, and only one (5%) had posteromedial knee dislocations. Motor vehicle accident was the mechanism of injury in 90% of the patients [Table 1]. All patients had standing-knee anteroposterior and lateral angiographies of the affected limb, 11 had magnetic resonance imaging (MRI), and seven patients underwent knee arthroscopy at the time of management. The interval between initial injury and orthopedic operation was 11 days (range: 0–90 days). Four patients underwent open reduction at the time of injury, whereas others were reduced through close methods. All patients started physiotherapy 2 weeks–3 months after surgery. The average time the patients returned back to their normal life was 8.5 months (range: 3–14 months) [Table 1].

### Outcome

The average knee range of motion in patients was  $98^\circ \pm 34^\circ$  (range:  $0^\circ$ – $140^\circ$ ) [Table 1]. Five patients had anterior cruciate ligament (ACL) injury and three had posterior cruciate ligament (PCL) injuries in the last follow-up. The number of ACL, PCL, medial collateral ligament (MCL), and lateral collateral ligament injuries among 11 patients who

had MRI study at the time of injury were 10, 7, 5, and 4, respectively [Table 1]. All the MCL tears were accompanied with PCL rupture as well. The Lachman test was positive in 20% of patients [Table 2]. Overall, the anterior drawer test and posterior drawer test were positive in 40% and 35% of patients, respectively [Table 2]. Varus and valgus stress tests were positive in 30° flexion in 10% and 35% of patients, respectively [Table 2].

Six patients had combined neural and vascular injury. At the time of injury, six patients had peroneal nerve injury; none of whom resolved until the last follow-up visit. No other nerve injury was reported. The distal pulse had not been detected at the time of injury in six patients, among whom, three managed with end-to-end anastomosis and three with vascular graft. Four of this repairs resulted to further thrombosis, but only one finger gangrene happened.

The average KSS and Lysholm knee scores were 65 (range: 15–97) and 68 (range: 18–100), respectively.

### Quality of life

The mean SF-36 Physical Component Score (PCS) and Mental Component Score (MCS) scores were 37 (range: 22–59) and 42 (range: 25–59), respectively. All domains of SF-36 were lower than that of the normal population ( $P < 0.001$ ) [Table 3].

### Factors impact knee function and patients' quality of life

We could not find any correlation between age, BMI, and interval between initial trauma and operation with outcome variables (Lysholm Knee Score, KSS, SF-36 PCS, and SF-36 MCS) [Tables 1 and 4].

## DISCUSSION

Posterior dislocation has been detected in half of the knee dislocation. Peroneal palsy was found in 30% of the cases. Vascular injury was observed in 30% as well. The average KSS and Lysholm knee scores were 68 and 83, respectively. The quality of life by SF-36 questionnaire among patients was lower than that of the normal population both in terms of physical and mental components. No independent factor that could directly affect the outcomes was found.

Most of the patients with traumatic knee dislocations are male with male-to-female ratio of 6:1. According to previous reports, the peak incidence of knee dislocations is in the third decade. Motor vehicle accidents account for two-third to one-half of the injuries.<sup>[2-4]</sup> Our demographic features were close to those reports, except that motor vehicle accidents were reported as high as 90% in our study. Posterior knee dislocation was the most common type in our series. The majority of the literature supports that anterior knee dislocations are the most common mechanism.<sup>[6,16,17]</sup> In the review by Green and Allen, 40% of 245 knee dislocations were anterior.<sup>[6]</sup> In line with other studies, posteromedial dislocation was the least common mechanism in our series.<sup>[1]</sup> The proposed mechanism of posterior dislocation is a direct application of a posterior force to the anterior tibia,<sup>[6]</sup> similar to dashboard strike to the anterior tibia while the knee

**Table 1: Demographic data in patients with knee dislocation (n=20)**

|  |         |
|--|---------|
| Age (years), mean±SD                                 | 34±15   |
| Sex, n (%)   |         |
| Male   | 17 (85) |
| Female   | 3 (15)  |
| BMI, mean±SD   | 24±4    |
| Mechanism of injury, n (%)                           |         |
| MVA  | 18 (90) |
| Fall   | 2 (10)  |
| Type of dislocation, n (%)                           |         |
| Posterior  | 12 (60) |
| Anterior   | 5 (25)  |
| Posterolateral                                       | 2 (10)  |
| Posteromedial  | 1 (5)   |
| Peroneal palsy, n (%)                                |         |
| Normal   | 14 (70) |
| Abnormal   | 6 (30)  |
| Vascular examination, n (%)                          |         |
| Normal   | 14 (70) |
| Abnormal   | 6 (30)  |
| Angiography, n (%)                                   |         |
| Normal   | 14 (70) |
| Abnormal   | 6 (30)  |
| Knee instability at final follow-up                  |         |
| Yes  | 14 (70) |
| No   | 6 (30)  |
| Ligament disruption according to arthroscopy, n (%)* |         |
| ACL  | 6 (86)  |
| PCL  | 4 (57)  |
| LCL  | 0 (0.0) |
| MCL  | 0 (0.0) |
| Ligament disruption according to MRI, n (%)**        |         |
| ACL  | 10 (91) |
| PCL  | 7 (64)  |
| LCL  | 4 (36)  |
| MCL  | 5 (45)  |
| Interval between injury to operation (days), mean±SD | 11±23   |
| Physiotherapy duration (months), mean±SD             | 2.5±2.3 |
| Lysholm score, mean±SD                               | 68±25   |
| KSS function score, mean±SD                          | 81±18   |
| KSS final score, mean±SD                             | 65±21   |
| Range of motion, mean±SD                             | 98±34   |

\*Among 7 patients, \*\*Among 11 patients. MVA: Motor vehicle accident, ACL: Anterior cruciate ligament, PCL: Posterior cruciate ligament, LCL: Lateral cruciate ligament, MCL: Medial cruciate ligament, KSS: Knee Society Score, BMI: Body mass index, SD: Standard deviation, MRI: Magnetic resonance imaging

is in a flexed position during an motor vehicle accident.<sup>[3,16]</sup> Considering that the majority of our patients were dislocated through a motor vehicle accident, the higher rate percentage of posterior knee dislocations is explained. The PCL is the base stone of posterior knee stability and is supposed to be ruptured in posterior dislocations.<sup>[1]</sup> In our series, the posterior drawer test was positive in nearly half of the knees. Although ACL is supposed to be the next common ligament injury in posterior knee dislocations, we could not confirm it through

negative Latchman test. Intact ACL was reported in Bratt and Newman's study as well.<sup>[18]</sup> Cadaver studies have shown that anterior dislocation initially produced injury to the ACL followed by injury to the PCL as hyperextension continued.<sup>[17]</sup> In our study, based on the Latchman and anterior drawer tests, the prevalence of ACL tears was twice the PCL ones among anterior knee dislocations.

The incidence of vascular injuries in association with knee dislocation varies between reports, ranging from 35% to

45%.<sup>[6]</sup> This rate was 30% in our series. Considering the 1.7% estimated complication rate of the angiography<sup>[19]</sup> new protocols had been designed to avoid performing angiography in all knees.<sup>[1,20]</sup> However, our policy was still using angiography for all dislocated knees. Meta-analysis showed that physical examination is not reliable in detecting vascular injuries among traumatic knee dislocation.<sup>[21]</sup> In Green and Allen's study, 44% of posterior dislocations and 39% of anterior dislocations had vascular injuries.<sup>[6]</sup> These rates were 30% and 28% in our series, respectively.<sup>[22]</sup>

Peroneal nerve palsies have been noted in 14%-35% of knee dislocations.<sup>[23]</sup> Functional recovery has been observed in as few as 50% of the cases.<sup>[24,25]</sup> This rate was 30% in our study and none of the peroneal nerves were completely recovered at the time of final visit. Peroneal nerve injuries in knee dislocations are usually the consequence of traction trauma along the posterior aspect of the femoral condyle results in axonotmesis over a large segment of the nerve; therefore, spontaneous recovery is not common.<sup>[24-26]</sup>

Consistent with the results of this study, the quality of life had been correlated negatively with physical activity,<sup>[27]</sup> and the positive effects of surgery and rehabilitation on knee function

**Table 2: Physical examination in the final follow-up**

|                       | Normal  | Mild (+) | Moderate (++) | Severe (+++) |
|-----------------------|---------|----------|---------------|--------------|
| Anterior drawer test  | 10 (56) | 5 (28)   | 2 (11)        | 1 (6)        |
| Posterior drawer test | 10 (59) | 4 (23)   | 2 (12)        | 1 (6)        |
| Valgus stress test    | 10 (59) | 4 (24)   | 2 (12)        | 1 (6)        |
| Varus stress test     | 15 (88) | 2 (12)   | 0 (0)         | 0 (0)        |
| Latchman test         | 13 (76) | 3 (18)   | 1 (6)         | 0 (0)        |

**Table 3: Different scores of short form-36 domains in normal population compared with patients with knee dislocation**

|                                       | Physical function | Physical role | Body pain | General health | Vital  | Social function | Emotional role | Mental health |
|---------------------------------------|-------------------|---------------|-----------|----------------|--------|-----------------|----------------|---------------|
| Patients with dislocation of the knee | 38 (12)           | 38 (12)       | 40 (14)   | 41 (12)        | 49 (9) | 37 (10)         | 37 (12)        | 41 (9)        |
| Normal population                     | 55                | 50            | 48        | 55             | 63     | 66              | 63             | 67            |
| P*                                    | <0.001            | <0.001        | <0.001    | <0.001         | <0.001 | <0.001          | <0.001         | <0.001        |

\*We used Mann-Whitney U-test for all the above variables

**Table 4: Evaluation of the factors affecting knee dislocation outcome**

|  | Lysholm score |       | KSS score   |       | SF-36 score PCS |       | SF-36 score MCS |       |
|--|---------------|-------|-------------|-------|-----------------|-------|-----------------|-------|
|  | Mean±SD       | P     | Mean±SD     | P     | Mean±SD         | P     | Mean±SD         | P     |
| Sex  |               |       |             |       |                 |       |                 |       |
| Male   | 67±26         | 0.874 | 80±18       | 0.81  | 37±13           | 0.964 | 43±9            | 0.45  |
| Female   | 70±19         |       | 83±15       |       | 38±4            |       | 38±12           |       |
| Instability at the time of last follow-up                    |               |       |             |       |                 |       |                 |       |
| Yes  | 64±28         | 0.23  | 62±23       | 0.26  | 39±13           | 0.53  | 44±10           | 0.48  |
| No   | 79±13         |       | 74±18       |       | 36±9            |       | 41±9            |       |
| Peroneal palsy   |               |       |             |       |                 |       |                 |       |
| Normal   | 74±23         | 0.121 | 82±18       | 0.497 | 35±14           | 0.614 | 44±10           | 0.237 |
| Abnormal   | 53±25         |       | 76±16       |       | 38±11           |       | 39±6            |       |
| Angiography  |               |       |             |       |                 |       |                 |       |
| Normal   | 74±23         | 0.121 | 82±18       | 0.497 | 35±14           | 0.614 | 44±10           | 0.237 |
| Abnormal   | 53±25         |       | 76±16       |       | 38±11           |       | 39±6            |       |
| We employed independent t-test in the above analysis         |               |       |             |       |                 |       |                 |       |
|  | Correlation   | P     | Correlation | P     | Correlation     | P     | Correlation     | P     |
| Age  | 0.21          | 0.37  | -0.093      | 0.69  | -0.26           | 0.27  | -0.13           | 0.59  |
| BMI  | 0.12          | 0.72  | -0.19       | 0.58  | -0.39           | 0.22  | -0.35           | 0.29  |
| Interval between injury and operation                        | -0.26         | 0.27  | -0.23       | 0.32  | -0.095          | 0.69  | -0.31           | 0.19  |
| Range of motion  | 0.39          | 0.094 | 0.39        | 0.091 | 0.34            | 0.091 | 0.26            | 0.28  |
| We employed Pearson's correlation test in the above analysis |               |       |             |       |                 |       |                 |       |

BMI: Body mass index, SD: Standard deviation, MCS: Mental Component Score, SF: Short Form, PCS: Physical Component Score



and the quality of life can be observed as early as 4 weeks after rehabilitation.<sup>[28]</sup> The significant impairment in quality of life after knee dislocation in our study is in line with a previous study.<sup>[22]</sup>

Although the knees in our series received reasonable average scores, the patients' quality of life was below the normal population. Injuries to other organs as well as prolonged treatment and rehabilitation course may explain these results. It is reported that more than 60% of patients with knee dislocation will ultimately end up with a relatively painless, stable knee that will allow them to return back to their previous level of activity.<sup>[2,3]</sup> Our patients resumed their normal life after 7.5 months.

The outcomes of knee dislocations with associated popliteal artery injuries are generally poor. Green and Allen estimated the amputation rate as 11% if vascular repair was undertaken before 8 h of ischemia, and it will be 86% if the delay takes more.<sup>[6]</sup> In our series, we had only one distal foot necrosis out of six vascular repairs.

As a limitation for our study, the patients' population was restricted to 20 which restricted us to employ multifactorial analysis. We believe that some of the insignificant results would relate to the low power of our study. Some of the data were extracted prospectively out of the patients' files. Although our hospital is a Level 1 trauma center at the west end of the country, the study was not multicentric.

## CONCLUSIONS

Knee dislocation is a condition with the high potential of vascular and neural complication. Although knee function after proper management is reasonable, prolonged course of management and multiple operations may decrease the patients' quality of life.

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## Conflicts of interest

There are no conflicts of interest.

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